ESDIS

ESDIS PERSPECTIVE

Presented at

ECS SDPS/CSMS Release A CDR

August 14, 1995

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TOPICS

- Earth Science Data and Information System (ESDIS) Project Orientation
- Earth Observing System (EOS) Ground System Overview
- System Management Office (SMO) Charter
- Proposed Briefings on ESDIS Technical Approach and Status

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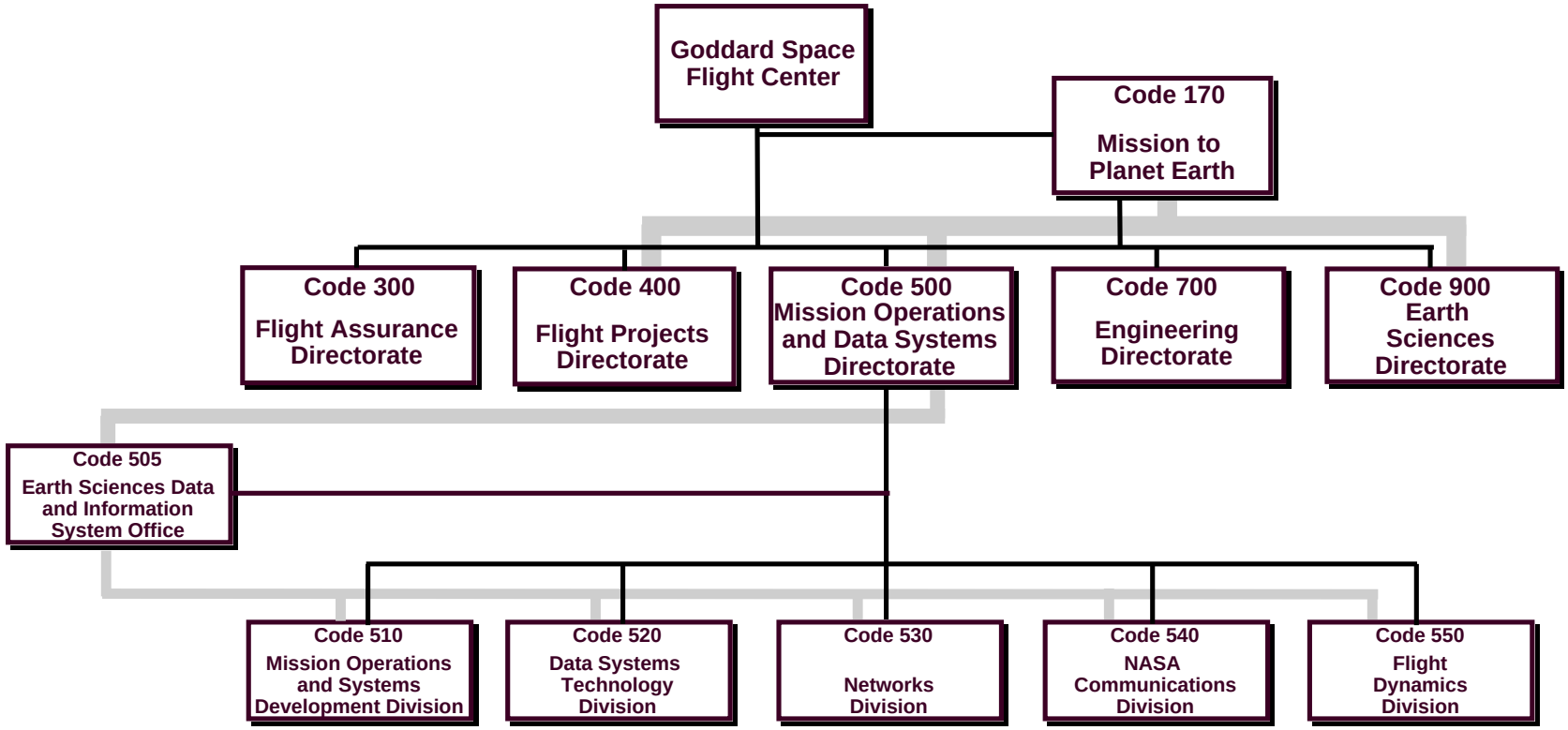
ESDIS Project Orientation: ESDIS at GSFC



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EGS Overview: Objectives and Goals

Goals:

- Provide an integrated system that will advance scientific understanding of the Earth system on a global scale
- Promote effective use of all spacecraft dedicated to Earth science

Objectives:

- Support EOS research activities to define the state of the Earth system
- Command and control the spacecraft and instruments
- Process, distribute, and archive EOS data
- Provide data interpretation and modeling support
- Support both current and future Earth science data sets
- Evolve in response to scientific research needs
- Design within resource constraints for reuse in broader GCDIS environment

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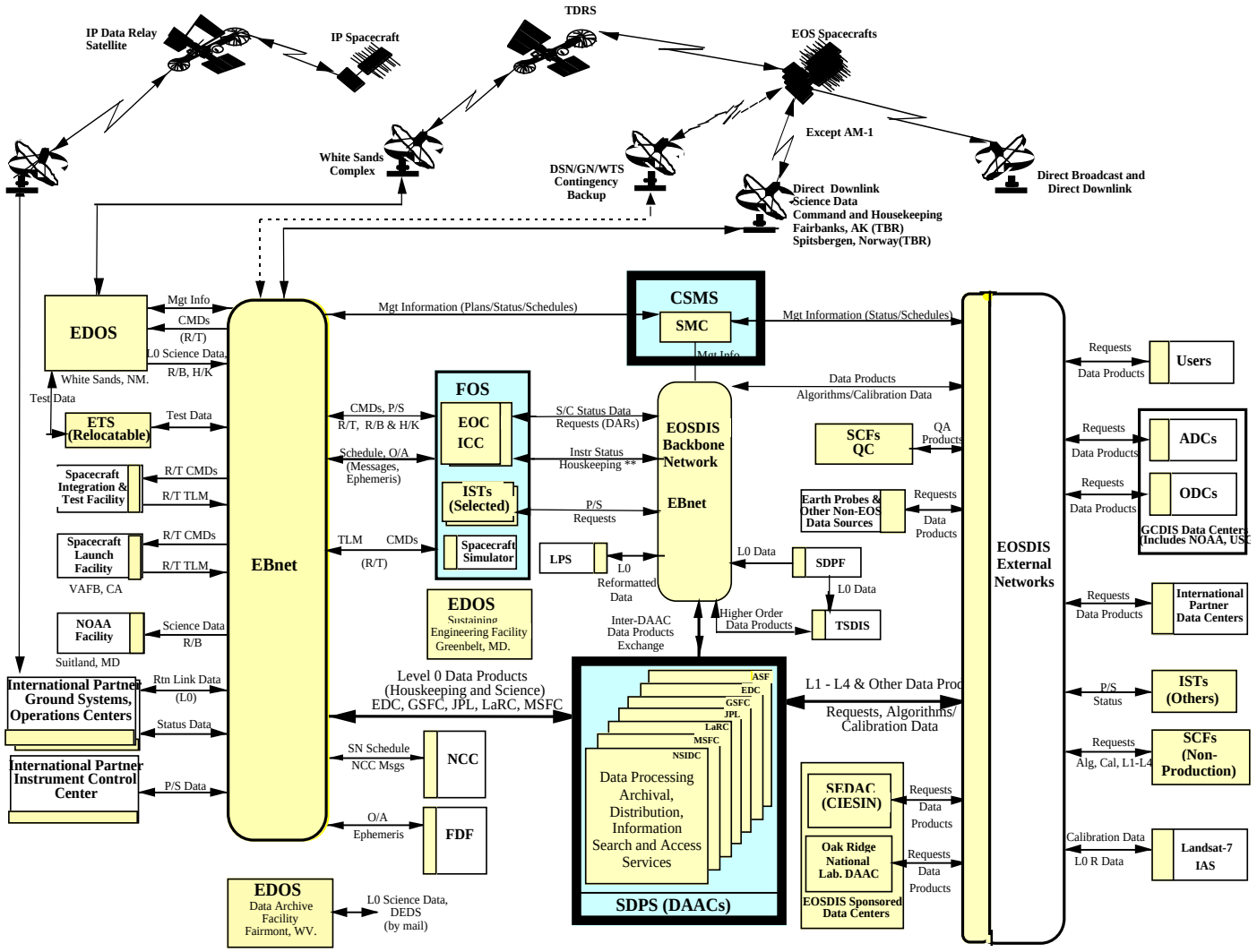
EGS Overview: EGS Elements and Components



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EGS Overview: Major Functions

Subsystem/Segment	Major Functions
FOS	Control all EOS spacecraft and validate commands to assure spacecraft health and safety Provide mission planning and scheduling Coordinate observations from multiple instruments Develop conflict-free schedules and provides mission timelines Monitor health and safety of spacecraft and instruments
CSMS	Develop infrastructure for distributed computing environment Provide coordination, status-tracking, and management of resources Establish, maintain, and manage DAAC local area networks
SDPS	Generate standard data products using investigator-provided algorithms/software Support data product reprocessing Manage and provide user interface to information about NASA's Earth science data Archive and distribute data according to the mission baseline
EDOS	Process telemetry, including data capture, CCSDS processing, rate buffering Provide forward link services Perform Level 0 production data processing Provide backup data archive for Level 0 production data Provide operations management
EBnet	Provide communications circuits and facilities to support: • spacecraft sheduling, maintenance, control, and coordination • EDOS to DAAC • DAAC to DAAC • EDOS to ASTER ICC
DAACs	Process and reprocess EOS data to standard data products Archive all standard products with ancillary data and information Provide data distribution, including electronic catalog, browse, accounting, and ordering Acquire, archive, and distribute non-EOS data critical to research Establish metrics for information management performance Host the ECS function
SCFs	Develop and maintain algorithms and science software Produce special data products Validate, analyze, and synthesize EOS and other data Provide scientific quality assurance of EOS data products
ETS	Serve as an early source of CCSDS formatted data during EOSDIS development Support ground system testing concerned with flight operations and Level 0 processing

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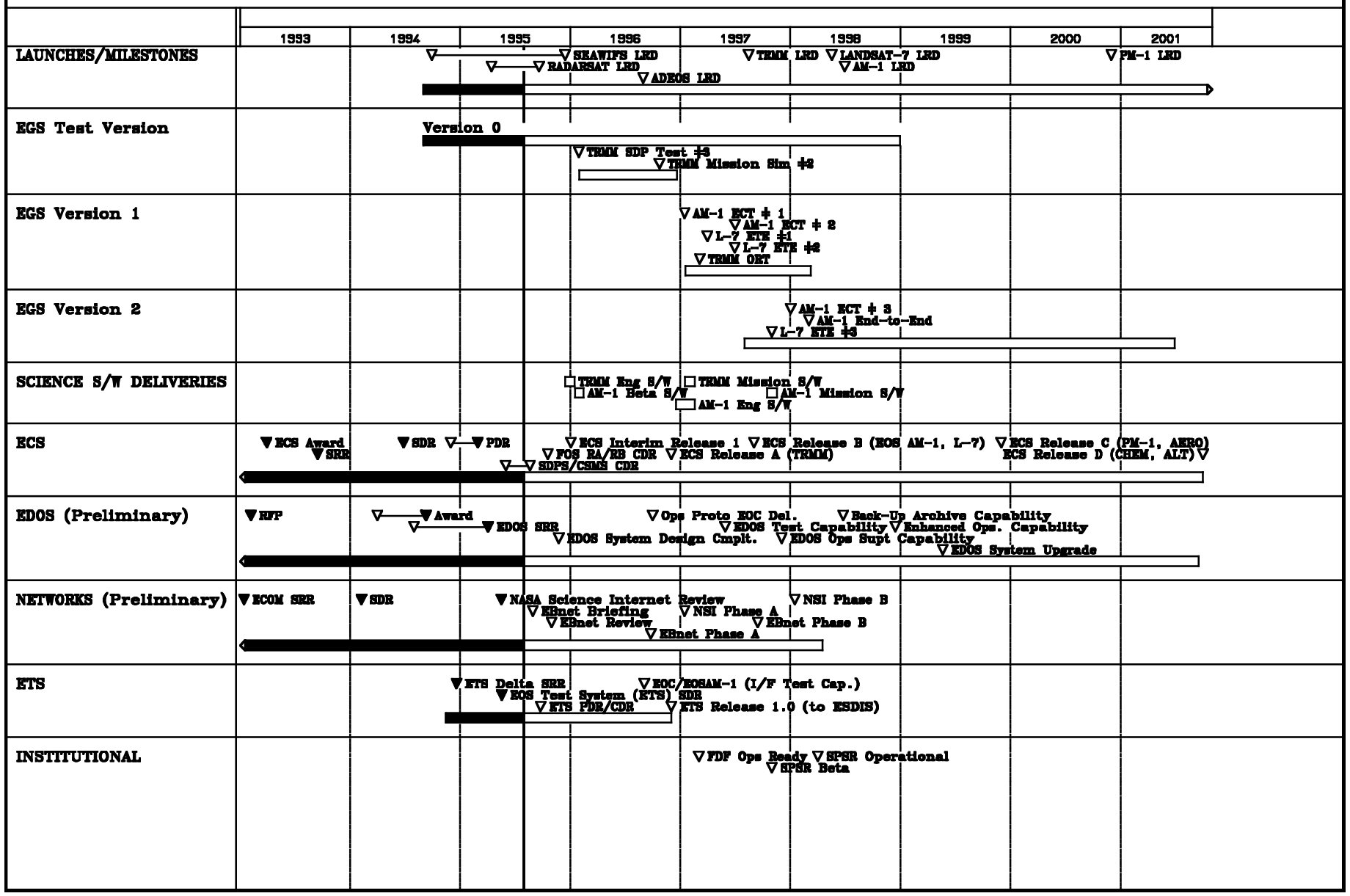
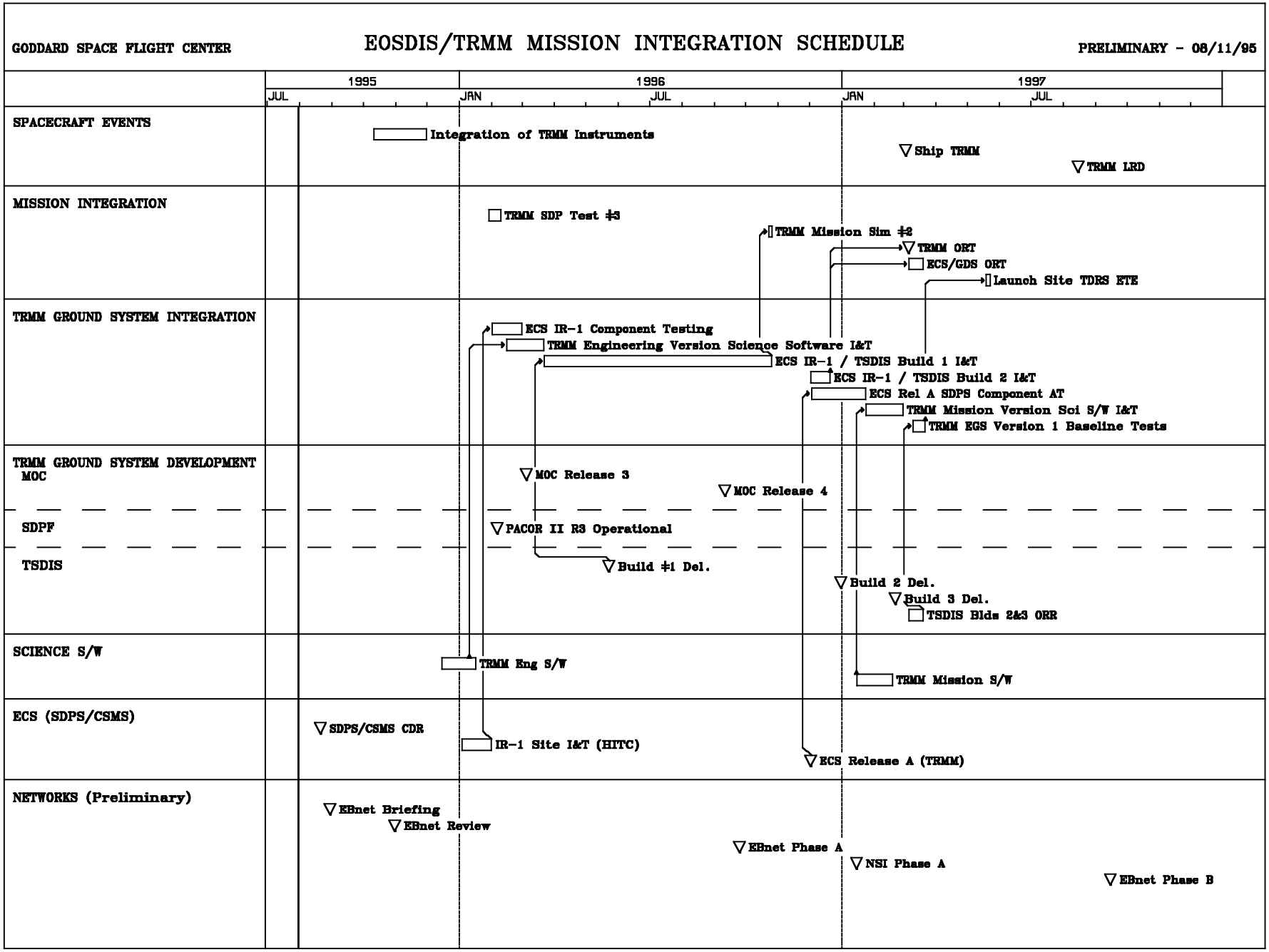
EARTH SCIENCE DATA & INFORMATION SYSTEM
MASTER SCHEDULE

ORIG APPROVAL 11/30/93
LAST CHANGE 08/11/95
STATUS AS OF 08/11/95




GODDARD SPACE FLIGHT CENTER
EOSDIS/TRMM MISSION INTEGRATION SCHEDULE
PRELIMINARY - 08/11/95
1995
1996
1997
JUL
JAN
JUL
JAN
JUL
SPACECRAFT EVENTS
Integration of TRMM Instruments
Ship TRMM
TRMM LRD
MISSION INTEGRATION
TRMM SDP Test #3
TRMM Mission Sim #2
TRMM ORT
ECS/GDS ORT
Launch Site TDRS ETE
TRMM GROUND SYSTEM INTEGRATION
ECS IR-1 Component Testing
TRMM Engineering Version Science Software I&T
ECS IR-1 / TSDIS Build 1 I&T
ECS IR-1 / TSDIS Build 2 I&T
ECS Rel A SDPS Component AT
TRMM Mission Version Sci S/W I&T
TRMM EGS Version 1 Baseline Tests
TRMM GROUND SYSTEM DEVELOPMENT
MOC
MOC Release 3
MOC Release 4
SDPF
PACOR II R3 Operational
TSDIS
Build #1 Del.
Build 2 Del.
Build 3 Del.
TSDIS Blds 2&3 ORR
SCIENCE S/W
TRMM Eng S/W
TRMM Mission S/W
ECS (SDPS/CSMS)
SDPS/CSMS CDR
IR-1 Site I&T (HITC)
ECS Release A (TRMM)
NETWORKS (Preliminary)
EBnet Briefing
EBnet Review
EBnet Phase A
NSI Phase A
EBnet Phase B

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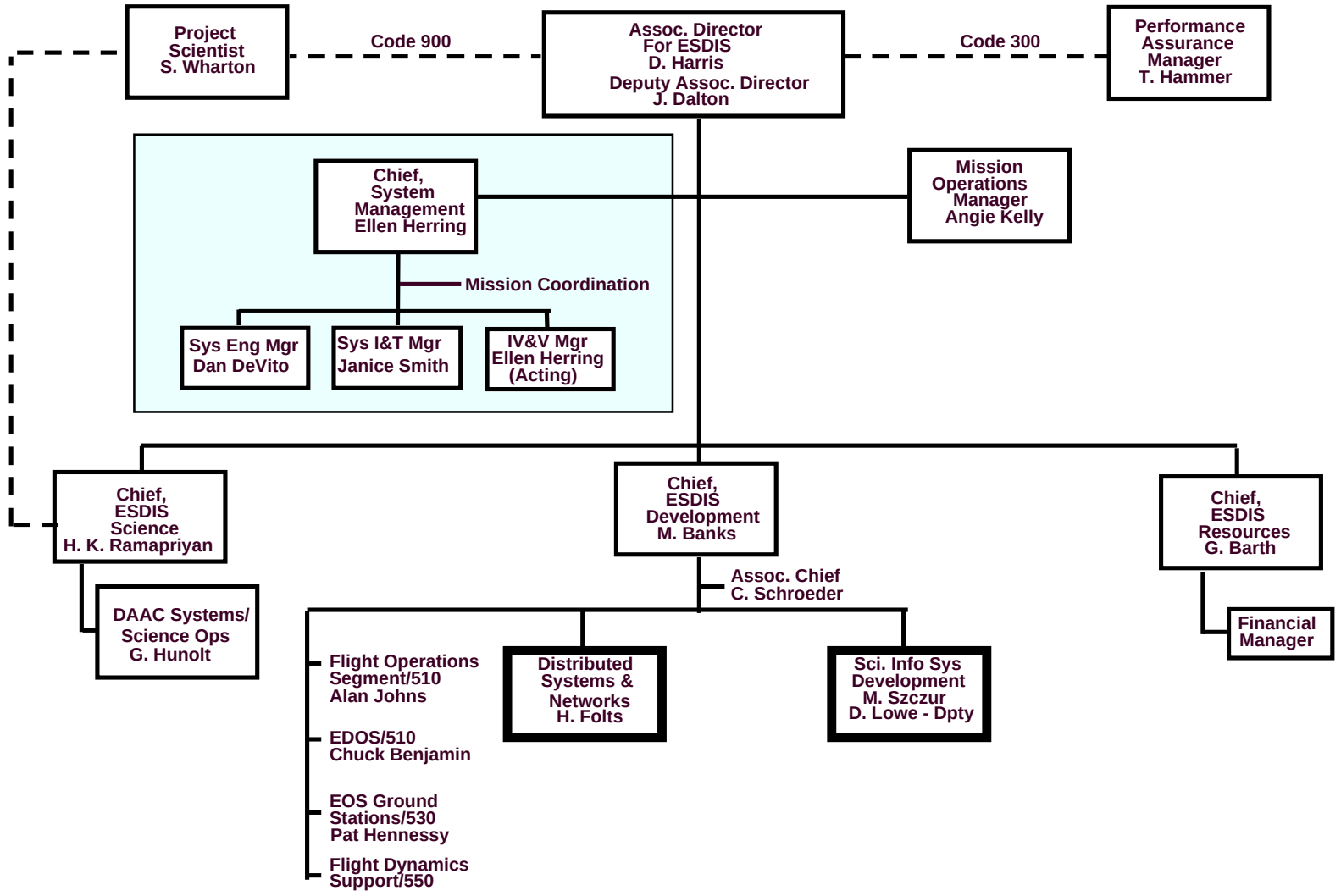
ESDIS Project Orientation: ESDIS Organization



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ESDIS Project Orientation: SMO Charter

System Management

(http://webserver.gsfc.nasa.gov/smo/smo.html)

Mission Coordination

- Status
- Progress
- Schedule
- Interfaces
- Issues

(homepage under evaluation)

System Eng Management

- System and Operations Concept
- Requirements Management
- Interface Management
- Risk Management/Mitigation
- System Architectural Integrity
- Information Architectural Integrity
- Trade Study Execution
- CCR/RID Evaluation and Impact
- EGS System Eng Coordination
- System Modeling

(http://webserver.gsfc.nasa.gov/syseng/syseng.html)

System I&T Management

- Test Philosophy Definition
- Test Policies and Guidelines
- Component/Seg I&T Support
- Development Schedule Verification
- Mission Integrated Schedule Dev
- Release Definition Support
- Key Interface Testing
- System Integration
- End-to-End Test Support
- CCR/RID Evaluation and Impact
- EGS I&T Coordination

(http://webserver.gsfc.nasa.gov/integ/integ.html)

IV&V Management

- Life Cycle Analysis
- Requirements Integrity
- Modeling Verification
- Comp/Sys Certification

(http://fairmont.ivv.nasa.gov/)

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EGS Integration and Test Roles and Responsibilities

Developer Tests	Gvm't Acceptance	GSFC ESDIS Tests		
Developer Component Accept Test	**Independent Accept Test**	**EOS Ground System Integration and Test**	**EOS Ground System Certification**	**Operations Readiness Testing**
ECS HAIS / NYMA	*Curt Schroeder (505)* Intermetrics			
EDOS TRW	*Chuck Benjamin (510)* CSC /Allied Signal			
EBnet Code 540	*Steve Smith (540)* Booz-Allen			
ETS CSC	*Willie Fuller (510)* Allied Signal			
Institutionals Code 500 Teams	*Gene Smith (505)* Various Facility Mods			
Sci Software Instrument Teams	*Steve Kempler (505)* Various DAAC Installs			
Test Phase Objectives	Validation of Allocated Requirements by Release	Validation of Interface Requirements (IRD/ ICD)	Validation of System Requirements	System and Operations Readiness Activities

J. Smith

Tasks To Be Accomplished

- Interface Testing
- Interface Certification
- Functional Data Flows
- Spacecraft Compatibility Tests
- Performance Assessment

SI&T Contractor
Intermetrics

SI&T Support
CSC
O&M Contractors
Instrument Teams
"Tirekickers"

E. Herring (Acting)

Tasks To Be Accomplished

- Certification Criteria Development
- Analysis of:
  - S/W Structure
  - Data Bases
  - Documents
- End-to-End Tests
- Validation of Requirements

IV&V Contractor
Intermetrics

IV&V Support
O&M Contractors
Instrument Teams
"Tirekickers"

A. Kelly/G. Hunolt

Tasks To Be Accomplished

- Staffing
- Training
- Procedures
- Mission Readiness Tests
- Operations Readiness Reviews

O&M Contractors

EOC - HAIS/Loral
DAAC - Various
ETS - CSC
EDOS - Allied
EBnet - Allied

Ops Readiness Support
Instrument Teams
"Tirekickers"

Product Turnovers

Component Delivery → Accepted Component → Integrated System → Certified System → Mission Ready System

7/26/95-E43

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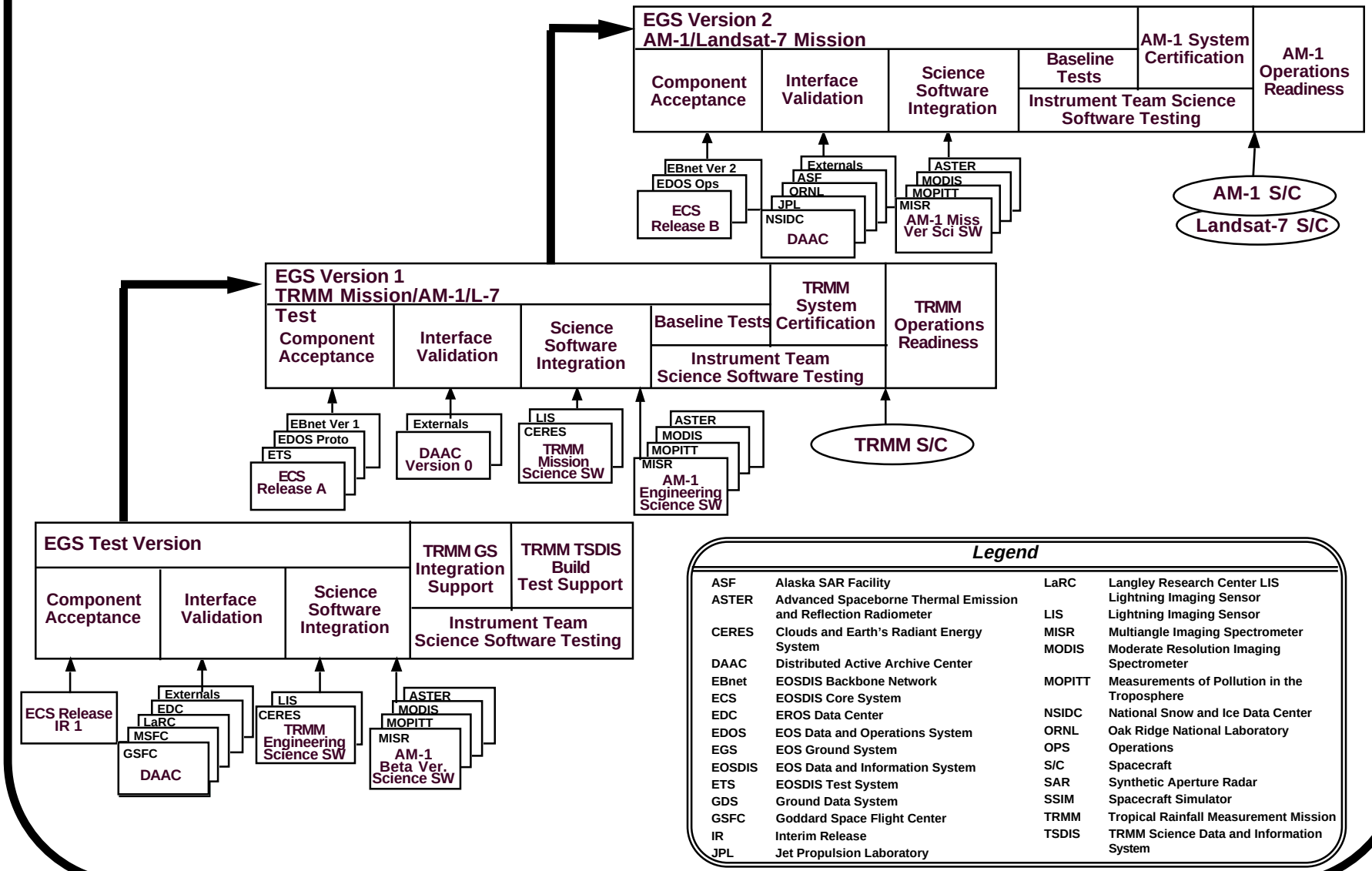
EGS I&T Implementation



Legend

ASF	Alaska SAR Facility	LaRC	Langley Research Center LIS Lightning Imaging Sensor
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer	LIS	Lightning Imaging Sensor
CERES	Clouds and Earth's Radiant Energy System	MISR	Multiangle Imaging Spectrometer
DAAC	Distributed Active Archive Center	MODIS	Moderate Resolution Imaging Spectrometer
EBnet	EOSDIS Backbone Network	MOPITT	Measurements of Pollution in the Troposphere
ECS	EOSDIS Core System	NSIDC	National Snow and Ice Data Center
EDC	EROS Data Center	ORNL	Oak Ridge National Laboratory
EDOS	EOS Data and Operations System	OPS	Operations
EGS	EOS Ground System	S/C	Spacecraft
EOSDIS	EOS Data and Information System	SAR	Synthetic Aperture Radar
ETS	EOSDIS Test System	SSIM	Spacecraft Simulator
GDS	Ground Data System	TRMM	Tropical Rainfall Measurement Mission
GSFC	Goddard Space Flight Center	TSDIS	TRMM Science Data and Information System
IR	Interim Release		
JPL	Jet Propulsion Laboratory		

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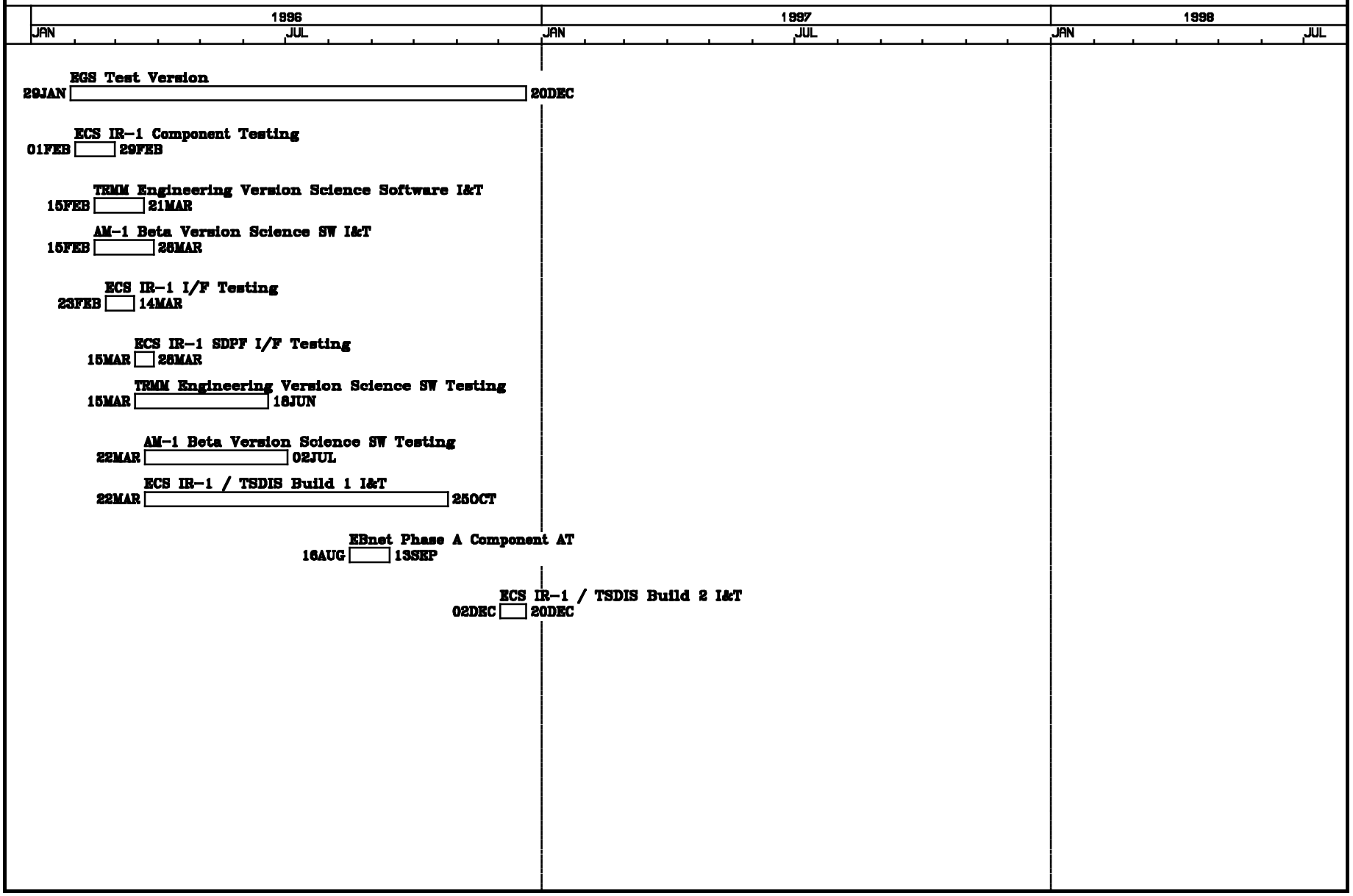
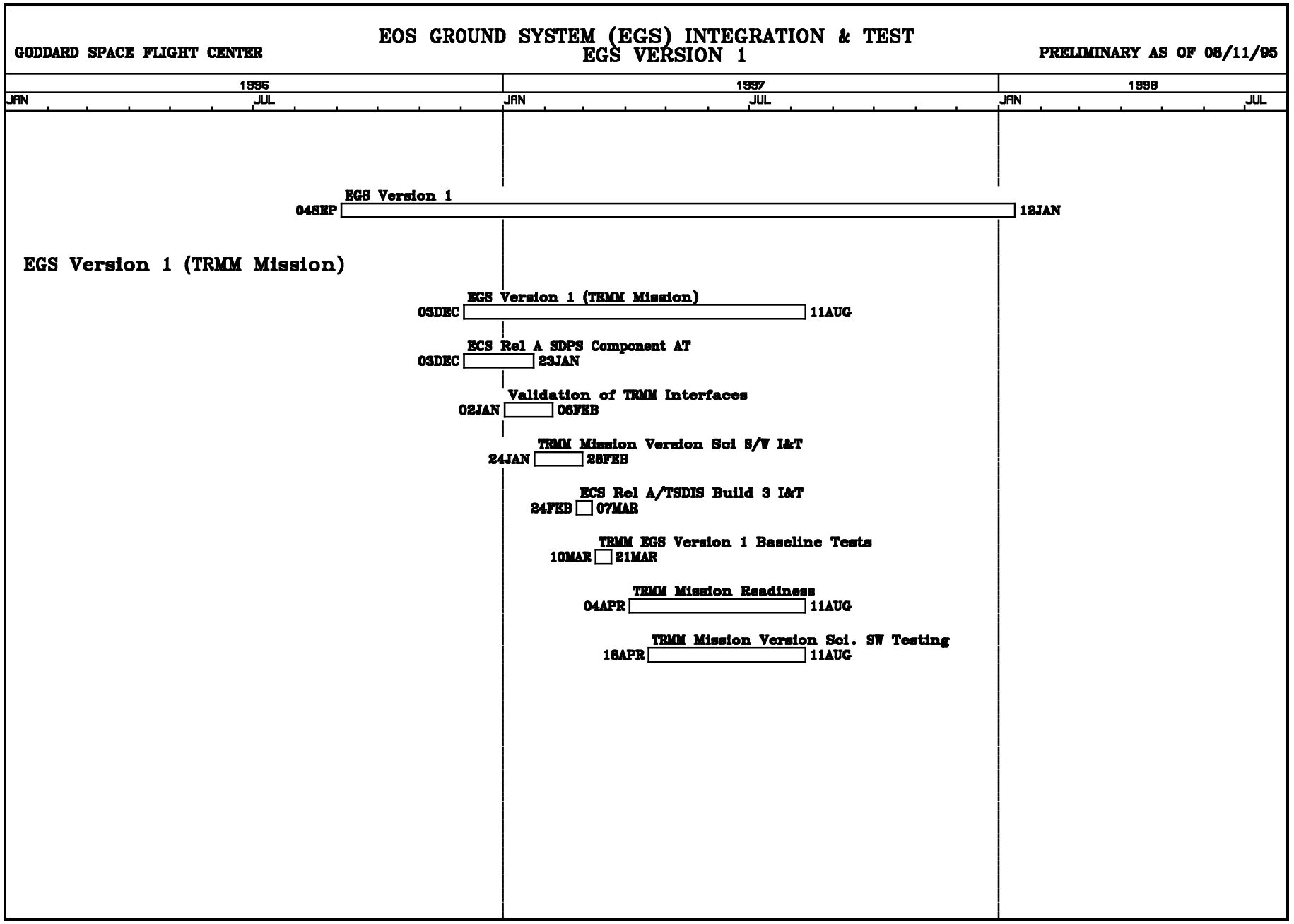
EOS GROUND SYSTEM (EGS) INTEGRATION & TEST
EGS TEST VERSION

PRELIMINARY AS OF 08/11/95




GODDARD SPACE FLIGHT CENTER
EOS GROUND SYSTEM (EGS) INTEGRATION & TEST
EGS VERSION 1
PRELIMINARY AS OF 08/11/95
1996
1997
1998
JAN
JUL
JAN
JUL
JAN
JUL
EGS Version 1
04SEP
12JAN
EGS Version 1 (TRMM Mission)
EGS Version 1 (TRMM Mission)
03DEC
11AUG
ECS Rel A SDPS Component AT
03DEC
23JAN
Validation of TRMM Interfaces
02JAN
06FEB
TRMM Mission Version Sci S/W I&T
24JAN
26FEB
ECS Rel A/TSDIS Build 3 I&T
24FEB
07MAR
TRMM EGS Version 1 Baseline Tests
10MAR
21MAR
TRMM Mission Readiness
04APR
11AUG
TRMM Mission Version Sci. SW Testing
18APR
11AUG

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Proposed ESDIS Technical Approach and Status (ETAS) Briefings

- **Goal: Provide system status of system engineering, development, integration, test, and certification efforts associated with EOSDIS and required to implement the EOS Ground System**

- **Objective is to ensure**
  - **Requirement and requirement allocation adequacy**
  - **End-to-end operations concept development**
  - **Development status visibility and consistency**
  - **Feasible integration, test, and certification plan**
  - **Continued operability for ongoing missions**

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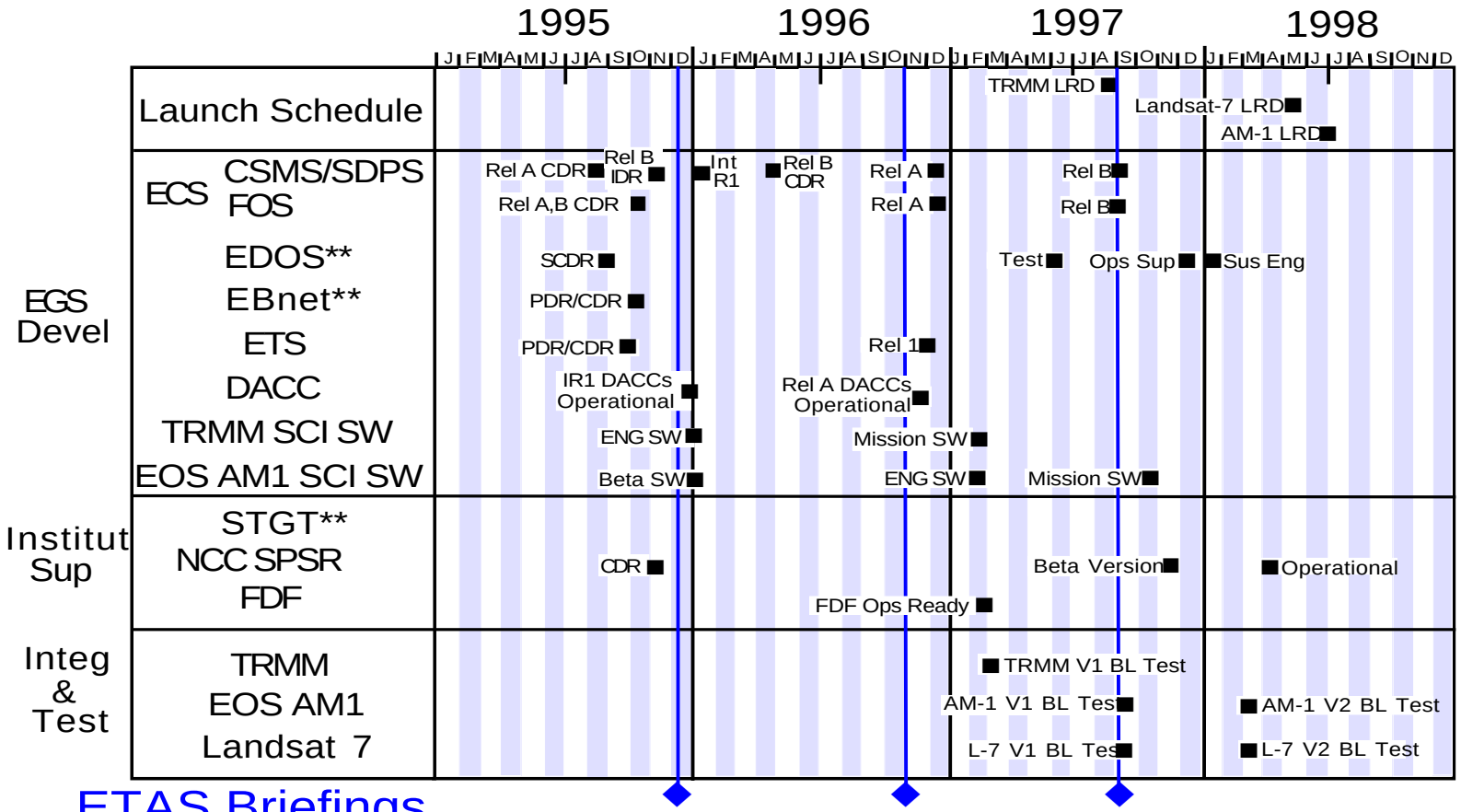
Proposed ETAS Briefing Schedule



** Schedules under replan or development

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Backup Charts

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SMO Activities: System Engineering

Activity	Recent Accomplishments	Coordination Mechanism
Reqmts Analysis	Completed level 2 Vol 0 requirements update; completed Draft Requirements Management Plan Established requirements traceability: completed level 2/level 3 requirements traceability for ECS; created requirements database with level 1/2/3 traceability for ECS, EDOS, ECOM Completed analysis of assigned ECS PDR RIDs	Biweekly Requirements Working Group meetings
Risk Management	Analyzed risks identified by ESDIS Project managers and DAAC engineers Created risk database; risk list on SE home page Completed preliminary Risk Management Plan	ESDIS Risk Management Board Participation in developers Risk Management processes
Interface Management	Identified interface documents, authors, schedules, and “book bosses” Established interface metrics (available on SE home page) Facilitated ESDIS CCB approval of 9 ECS IRDs	Biweekly Interface Control Working Group (ICWG) meetings
Prototyping	Established priorities and budget allocation approach Recommended prototype selections to Data Panel subcommittee Defining Testbed approach	Host Technology Workshops EMail and Web communications

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SMO Activities: System Engineering

Activity	Recent Accomplishments	Coordination Mechanism
Information Architecture	Supported evaluation and refinement of EOSDIS data architecture with ITs, DAACs, and external organizations Negotiate, analyze, and support integration of international and agency standards (CEOS, FGDC, etc..)	Data Modeling Working Group meetings
System Architecture	Developed white papers and presentations in support of GAO, IAR, LaJolla external reviews Developing technology infusion process Coordinating resolution of requirements design evolvability issues relevant to system architecture	EMail and Web communications
System and Operations Concept	Completed scenario development using working sessions with stakeholders Developing Operations Concept document for Sept delivery	Working group meetings
Modeling	Reviewing prior end-to-end modeling activities Evaluating EOSDIS modeling tool output Updating ESDIS Project Draft Modeling Strategic Plan	Biweekly working group meetings

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System Integration and Test

Recent Accomplishments	Coordination Mechanisms
Established SI&T home page URL http:// webserver.gsfc.nasa.gov/integ/integ.html Documented EGS I&T philosophy (March 1995) Developed and are maintaining EGS I&T schedules Defined and implemented Test Data Management (TDM) tool (May 1995) Generated SI&T plan (August 1995) Supported/participated in Flight Project Status and Design Reviews Defining simulated test data needs in conjunction with other users and MTPE Office Managing ESDIS ETS development	DAAC 1-on-1 Meetings Biweekly Flight/Ground Working Group Meetings (TRMM, Landsat-7, AM-1) Periodic SI&T Working Group Meetings Home Page Inputs DAAC System Engineering Telecons Instrument Working Group Meetings

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Independent Verification and Validation

Recent Accomplishments	Coordination Mechanisms
Established the IV&V home page http://fairmont.ivv.nasa.gov/ Baselined the IV&V Management Plan (December 1994) Baselined the IV&V EGS Integration, Test and Validation Plan (EITVP) (June 1995) Established an integrated support environment for IV&V tools development (June 1995) Issued the Component Acceptance Master Test Plan August 1995 Submitted technical analysis memos (requirements, interface, and design) Developed ECS Release A CDR evaluation criteria	Document Reviews Requirements Traceability Management Analysis Interviews Analysis Reports Working Group Meetings Development Model Assessment

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Mission Coordination

Recent Accomplishments	Coordination Mechanisms
Coordinated EGS integration into TRMM Ground Data System Certification Plan Coordinated EGS support to Landsat-7 ground system acceptance Coordinated EOS AM-1 End-to-End Biweekly Mission Support Meetings Developed mission unique system schedules Resolved mission to ground system issues – IR-1 capability to support TRMM mission simulation – ETS to SSIM interface incompatibility – ASTER ground data system interface Generated/coordinated drafts of SAGE III PIP and PM IPA Conducted April Flight Of Opportunity (FOO) Workshop	Informal Discussions Biweekly Meetings With Flight Projects Periodic Aster GS Interface Working Group Meetings

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Acronyms

ADC	-	Affiliated Data Center
AM-1	-	EOS Morning Flight-1
CCB	-	Configuration Control Board
CCR	-	Configuration Change Request
CCSDS	-	Consutative Committee for Space Data Systems
CDR	-	Critical Design Review
CEOS	-	Committee on Earth Observation Satellites
CSMS	-	Communications and Systems Management Segment
DAAC	-	Distributed Active Archive Center
EBnet	-	EOSDIS Backbone Network
ECS	-	EOSDIS Core System
EDOS	-	EOS Data and Operations System
EGS	-	EOS Ground System
EOC	-	EOS Operations Center
EOS	-	Earth Observing System
EOSDIS	-	EOS Data and Information System
ESDIS	-	Earth Science Data and Information System
ETAS	-	ESDIS Technical Approach nad Status
ETS	-	EOSDIS Test System
FDF	-	Flight Dynamics Facility
FGDC	-	Federal Geographic Data Committee
FOO	-	Flight of Opportunity
FOS	-	Flight Operations Segment
GAO	-	General Accounting Office
GCDIS	-	Global Change Data and Information Center
GS	-	Ground System
I&T	-	Integration and Test
IAR	-	Internal Audit Report
IAS	-	Image Assessment System
ICC	-	Instrument Control Center
ICD	-	Interface Control Document
ICWG	-	Interface Control Working Group
IR 1	-	Interim Release 1
IRD	-	Interface Requirements Document
IST	-	Instrument Support Terminal
IT	-	Instrument Team
IV&V	-	Independent Verification and Validation
LPS	-	Landsat Processing System
MTPE	-	Mission to Planet Earth
NCC	-	Network Control Center
ODC	-	Other Data Center
PDR	-	Preliminary Design Refiew
PM-1	-	EOS Afternoon Flight-1
RID	-	Review Item Discrepancy
SCF	-	Science Computing Facility
SDPF	-	Sensor Data Processing Facility
SDPS	-	Science Data Processing Segment
SI&T	-	System Integration and Test
SMC	-	System Management Center
SMO	-	System Management Office
SPSR	-	Service Planning Segment Replacement
STGT	-	Second TDRSS Ground Terminal
TMD	-	Test Data Management
TRMM	-	Tropical Rainfall Measuring Mission
TSDIS	-	TRMM Science Data and Information System
URL	-	Universal Resource Locator